

*Average solar radiation at noon at Lausanne, Switzerland, in gram-calories per square centimeter per minute.*

Month.	1897-1902.	1903.	Difference.
January.....	0.79	0.68	0.11
February.....	0.86	0.71	0.15
March.....	0.89	0.70	0.19

M. Dufour is inclined to attribute this deficiency to the presence of large quantities of volcanic dust in the air as the result of the eruptions of last year in the West Indies.

It is evident that the solar radiation of M. Dufour is the radiation from the sun, as received by us on the earth, after it has been diminished by the very appreciable losses due to absorption and other atmospheric influences. This insolation, as actually measured by physicists, is expressed in gram-calories per square centimeter per minute. It has regular diurnal and annual variations but the abnormal variations are those that we are now considering.

Observations of insolation were made by me for the United States Weather Bureau with an Ångström electrical compensation pyrheliometer, from November 10, 1902, to March 26, 1903, at Asheville and Black Mountain, N. C., at an elevation of about 2200 feet and a latitude of about 35° 36'. There are no previous observations at these points with which to compare results, but it was noted at the time and was the occasion of comment, that the measurements did not increase after December as much as had been expected. The following are the monthly averages for the dates of observation, at noon, in gram-calories per centimeter per minute:

Year and month.	Asheville.		Black Mountain.	
	Insolation.	Mean altitude of sun.	Insolation.	Mean altitude of sun.
1902.		°		°
November.....	1.093	36.2		
December.....	0.948	31.2		
1903.				
January.....	0.832	33.2		
February 1-14.....	0.985	39.3		
February 19-March 26.....			0.986	47.8

The complete record will be published as a bulletin of the Weather Bureau.

Observations with a Crova actinometer have been continued for many years at Montpellier, France; in the MONTHLY WEATHER REVIEW for April, 1902, Vol. XXX, p. 179, Mr. C. G. Abbot has attributed a marked depression for the years 1884-1886 in the curve of mean annual noon insolation to the presence of large quantities of volcanic dust in the air, due to the eruption of Krakatoa in 1883.

While these conclusions appear to be plausible, particularly in the case of the long-continued depression of 1884-1886, there are other causes that may have contributed to the diminished insolation noted in North Carolina this past winter. The atmospheric conditions and the movement of storms in the United States were abnormal, particularly during March, when an area of high barometer persistently remained off the North Atlantic coast, causing in North Carolina winds from the ocean, much cloudiness, and rain.

It is difficult to distinguish between cause and effect in this case. Was the apparent slowing up of the eastward movement of high areas due to diminished insolation, or was the diminished insolation due to increased absorption and reflection of the heat rays as they passed through the earth's atmosphere? If the latter, was the excessive absorption and reflection due to the presence of volcanic dust in unusual quantities, or to an unusual amount of aqueous vapor in the atmosphere, particularly in the upper strata, due perhaps to local anomalies in the atmospheric circulation?

There seems to be no reason why this latter explanation will

not suffice for the observations made in this country when considered by themselves, but if the insolation was deficient over most of the Northern Hemisphere, and continued to be deficient for a period of several months, then some more general explanation must be sought for. If volcanic dust is the cause, no doubt it will manifest itself in other ways, as, for instance, by causing brilliant after glows following the usual sunset colors. Observations of insolation and of sunsets for the coming months should therefore have special interest for meteorologists.

The following monthly means of insolation observed with the Ångström apparatus at Washington, D. C., at noon on clear days during April, May, and June, 1893, are added as this note goes to press:

*Solar radiation, in gram-calories per square centimeter per minute.*

Month.	Number of days.	Insolation.
1903.		
April.....	7	1.024
May.....	9	1.022
June.....	4	0.982

### HAILSTORMS IN PORTO RICO.

By Mr. W. H. ALEXANDER, Observer Weather Bureau, dated April 30, 1903.

Hailstorms are so rare in Porto Rico that the impression seems to be quite general even among Porto Ricans that they never occur. This is a mistake as was recently demonstrated. The change of season from winter to summer occurs about the middle of April and is, as a rule very marked, being characterized by unusually warm, sultry days, frequent thunderstorms, the setting in of the trades, and in a measure the beginning of the so-called rainy season. This year was no exception unless it be in the unusual strength with which the trades have set in. The records show that from the 11th to the 14th thunderstorms were quite general over the island. The only important, because unusual, feature of the season worthy of special mention was the occurrence of a heavy precipitation of hail on the 12th instant in the vicinity of Caguas. Thinking a report of this might be of interest, effort has been made to secure as full and accurate information relative thereto as possible. Two intelligent gentlemen, one an American and the other a Porto Rican, who were eyewitnesses of the event have been interviewed, and their reports are fully reliable and confirm other information obtained from other sources.

The forenoon of Sunday, April 12, 1903, was warm and sultry, very favorable for the development of thunderstorms. It appears that the storm now under consideration had its beginning about 2 p. m. in the neighborhood of Aguas Buenas, moved eastward along and down the valley of the Bairo River, across the Loiza, and up the valley of the Gurabo. The storm was accompanied by some lightning and thunder and very violent winds, rendered more violent and destructive, no doubt, by the peculiar topography along the storm's track. Some small huts were overturned and considerable damage done to the uncut tobacco along the valley of the Bairo River.

Hail was first observed at Aguas Buenas where, as reported by Mr. Bowser, the fall was light, lasting about ten or twelve minutes, but farther down the river the fall was so heavy that the river bed was "white as snow," so thick were the hailstones. The track of the storm appears to have been just north of Caguas, although hail fell there for about fifteen minutes according to Dr. Lugovíño, who was in the city at the time. The precipitation of hail continued as far as Gurabo, but how much farther is not known.

As to the size and form of the hailstones, there are several

